REMARKS

In the Office Action of February 18, 2005, claims 15-24 were rejected under 35 U.S.C. 103(a) as unpatentable over Ito, et al. (U.S. Patent No. 6,683,767) in view of Giacomotto, et al. (U.S. Patent No 6,744,242). Claims 1-14, 25 and 26 were withdrawn from consideration as directed to non-elected inventions.

Applicants' invention is directed to a voltage regulator that adjusts the operating voltage of an integrated circuit to compensate for the effects of variations in the circuit fabrication process. The voltage regulator includes a voltage down-converter that converts an off-chip supply voltage to a converted voltage that is supplied to the integrated circuit, a signal generator for generating a signal indicative of the desired voltage, and a detector for measuring at least one electrical or operational parameter of the integrated circuit when the integrated circuit is operated at a nominal voltage.

As the Examiner is aware, the '767 patent discloses a voltage down-converter (150-157) on an integrated circuit. The emphasis in the '767 patent is on the advantageous layout of the integrated circuit so as to accommodate the voltage down converters. Further, the '767 patent discloses a reference voltage generator (60,100) for specifying the desired step-down voltage. At Col. 3, lines 40-42, the '767 patent indicates that the characteristics of generator 100 are determined by trimming information held in an electrically erasable non-volatile memory. The Examiner concedes that the '767 patent does not disclose a detector for measuring at least one electrical or operational parameter of the integrated circuit. Indeed, the '767 patent teaches away from applicants' invention because it teaches a system in which the output

voltage from the voltage down converter is specified by trimming information stored in memory rather than by direct read out from the operating integrated circuit.

To make up for the deficiency of the '767 patent, the Examiner points to the use of voltage sensors 110 to sense a microprocessor circuit operating voltage as described at Col. 2, lines 62-67 of the '242 patent and asserts that it would be obvious to combine the '767 and '242 patents so as to prevent the undervoltage and overvoltage conditions described in the '242 patent.

Applicants respectfully disagree. The purpose of the voltage sensors 110 in the '242 patent is to sense undervoltage and overvoltage conditions in the integrated circuit due to extraordinary on-chip current demand. Upon sensing an undervoltage condition, a control circuit triggers a bidirectional current source 130 to source current thereby preventing the microprocessor circuit voltage from decreasing below a safe level. Conversely, upon sensing an overvoltage condition, the control circuit triggers bidirectional current source 130 to sink current, thereby preventing the microprocessor circuit voltage from exceeding a safe voltage level. This is not the problem addressed in the '767 patent and indeed there is no suggestion of this problem in the '767 patent. Accordingly, there is no incentive to combine the '767 patent with the '242 patent. Conversely, there is no suggestion in the '242 patent of the desirability of combining its circuitry with the layout solutions of the '767 patent.

Because they are directed to solving two different problems, there is no reason to combine the two references. Indeed, it is not seen how the two references could be combined because the '767 patent teaches a system in which the output of the voltage down converter is a static voltage level specified by the value stored in the electrically

erasable non-volatile memory while the '242 patent teaches a system in which the output of the control circuit is a dynamically changing signal that adjusts as necessary to offset a sensed undervoltage or overvoltage condition.

Moreover, even if the two references were somehow combined to prevent undervoltage and overvoltage conditions as asserted by the Examiner, this would not solve the problem addressed by the Applicants which is to measure performance parameters of the integrated circuit and to adjust the operating voltage of the integrated circuit in accordance with those measurements so as to compensate for the effects of variations in the semiconductor fabrication process.

To emphasize the differences between applicants' invention and the cited art, claim 15 has been amended to explicitly recite a detector for measuring at least one electrical or operational parameter of the integrated circuit when the integrated circuit is operated at a nominal voltage and an evaluator to determine a desired value of the operating voltage. Much of this language was originally in claim 18 which has been cancelled.

Applicants submit that claim 15 as amended defines over the references cited. As the Examiner concedes, the '767 patent does not disclose a detector. Neither does the '767 patent disclose an evaluator. And while the '242 patent discloses the use of a sensor, the sensor of the '242 patent is used to detect undervoltage and overvoltage conditions arising from extraordinary current demand in the integrated circuit. In contrast, as recited in claim 15 the detector of the present application measures a circuit parameter or parameter while the circuit is operated at nominal voltage. As indicated at page 5, lines 15-18 of the specification, nominal voltages is the design voltage of the

integrated circuit. Thus, the circuit of the present invention does not detect undervoltage or overvoltage conditions caused by extraordinary current demand but rather the deviation from expected conditions due to process variations where the circuit is operated at its designed voltage.

In addition, claim 15 distinguishes over the '767 and '242 patents in specifying that a signal indicative of the desired value of the operating voltage is applied to the voltage down converter from the evaluator. In contrast, there is no evaluator in the '767 patent; and the output from the sensors of the '242 patent is a signal indicative of an undervoltage or overvoltage condition that controls a bidirectional current source.

For these reasons, it is respectfully submitted that claim 15 is patentable over the references.

Dependent claims 16, 17, 20 and 21 are believed patentable for the same reason claim 15 is patentable.

Independent claim 22 has been amended to specify that the circuit parameter is measured when the circuit is operated at the nominal voltage. Claim 22 is believed patentable for the same reason claim 15 is patentable.

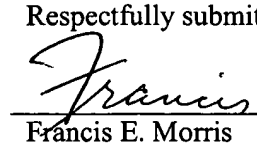
Dependent claims 23 and 24 are patentable for the same reason claim 22 is patentable.

In view of the forgoing remarks, the claims in this application are believe to be in condition for allowance. Such action is respectfully requested. If the Examiner believes a telephone interview would expedite prosecution of this application, she is invited to call applicants' attorney at the number given below.

Aside from the fee for an extension of time, no additional fees are believed to be due. However, if a fee is due, the Patent Office is authorized to charge Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 for all required fees for this reply and any further reply requiring a petition for extension of time for its timely submission. A copy of this sheet is enclosed for such purpose.

Respectfully submitted,

Date: August 15, 2005



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